

Experiment Info:

Planted:	5/14/15
Harvest:	
Yield Goal:	
Target Fert.:	
Variety:	
Population:	
Row Width:	30"
Prev. Crop:	Soybean
Plot Size:	15 x 100 ft
Replications:	-
1) 9-18-9	Orthophosphate
2) 9-24-3	Pro-Germinator
3) 10-34-0	Amm. polyphosphate
4) control	
Lysimeters type:	
	10 RHIZON SMS

Soil Test Values (ppm):

pH:	6.6
CEC:	6.1
%OM:	1.3
Bray P1:	31
Bicarb P:	-
K:	74
S:	-
%K:	3.1
%Mg:	17.6
%Ca:	72.1
%H:	0
Zn:	-
Mn:	-
B:	-

Introduction:

Pro-Germinator formulation consists of 30% Orthophosphate and 70% Polyphosphate. The Polyphosphate is encapsulated in a carbon based plant protein to reduce fixation with soil cations and extend its usability by plants after application in a planter band with the seed in corn.

As known, elemental phosphorus (P) is extremely reactive in soil and once the soil is moist, P transforms mostly to ionic forms: $H_2PO_4^-$ in acidic conditions and to HPO_4^{2-} in alkaline conditions as the only forms in which phosphate is absorbed by plants. Knowledge of ion exchange in soils would predict that anions are not retained by the negative charged soil colloids, and move in the soil similar to nitrogen. But, P moves very little, or is relatively immobile in the soil compared to nitrogen and is not lost into the atmosphere. Rarely does it leach beyond the reach of roots, even with large amounts of precipitation or irrigation and this apparent anomaly is that the soil solution contains only a very small amount of available phosphorus (0.05- 0.2 part per million) in ionic forms at any one time. However, research proved that the soil solution levels for phosphorus considered critical for plant growth range from 0.2 to 0.3 ppm. This information is extremely important because crops take up phosphorus only from the soil solution, and the relative mobility of phosphorus in the sandy soils has alternative dynamics due to the known criteria of phosphorus mobility by mass flow.

Objective:

To evaluate the controlled release process of phosphorus in the Pro-Germinator liquid fertilizers compared with other liquid fertilizers of different formulations and sources.

Methods:

1. Dynamic soil sampling, pre-planting and through the cropping season for measurements of the available phosphorus that adsorbed on active soil surfaces.
2. Micro-lysimeters made of micro-porous hydrophilic Teflon enabling an improved suction of soil solution were used as an advanced technology to measure plant usable phosphorus which is dissolved in the soil solution.

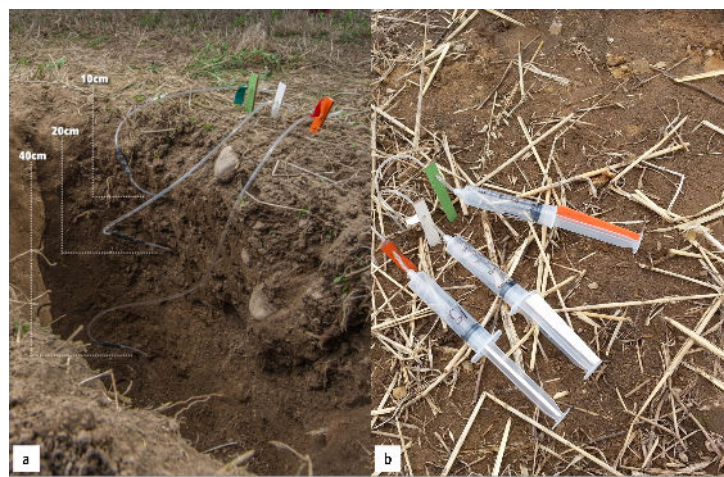


Figure 1. Micro-lysimeters positioned in soil wall at three soil depths (a) and soil liquid suction process (b).

Four treatments of Pro-Germinator, synthesized liquid formulations of 9-18-9 (Orthophosphate) and 10-34-0 (ammonium polyphosphate) liquid fertilizers, and control, were band-applied at a rate of 20 Pound of P_2O_5 /Acre of each liquid fertilizer in a plot of 15 X 100 ft. with 30" row spacing and 4" in furrow within row corn plants in farm 3. Fertilizers were planter applied directly in the seed furrow.

Results:

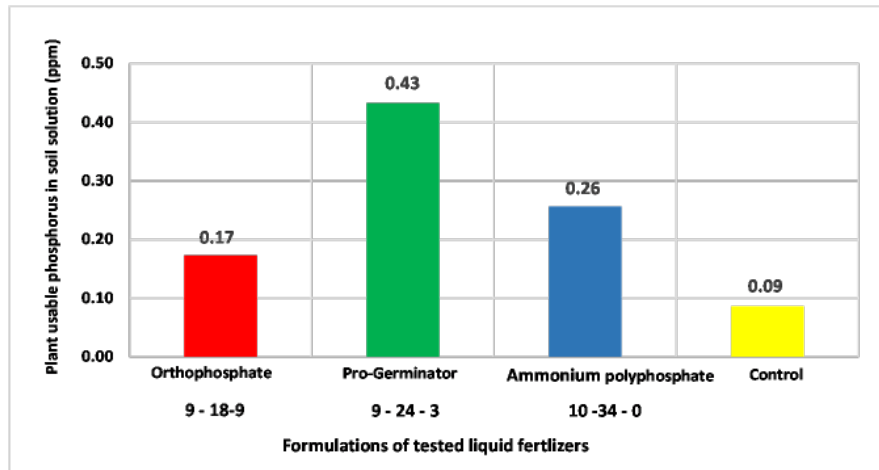


Figure 2. Averages of dissolved phosphorus in soil water (ppm) at 4" during 20 - 60 days after planting suctioned by lysimeters in Farm 3 at NCRS cropped with corn during the summer of 2015

Measurements of phosphorus in soil solution revealed an efficient slow release of phosphorus in the Pro-Germinator liquid fertilizer treatment compared with other sources of liquid phosphorus formulations. This provides an extended usability of phosphorus to plants after application of Pro-Germinator at planting.

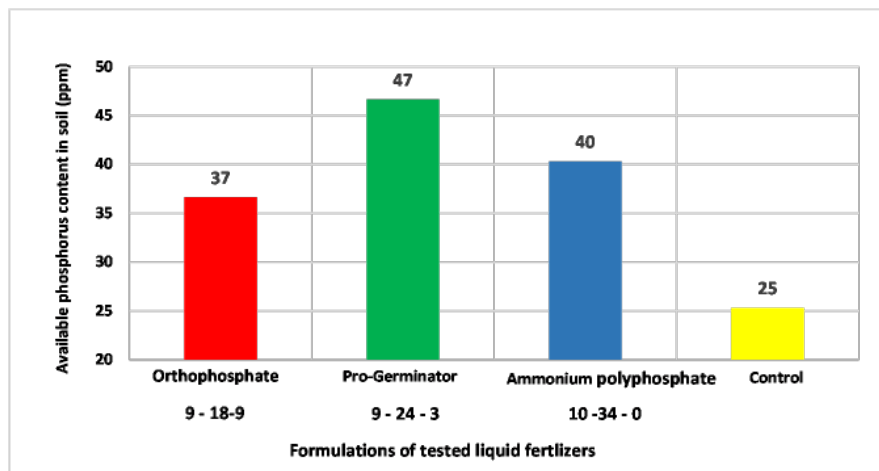


Figure 3. Averages of available phosphorus in soil (ppm) at 4" during 15- 80 days after planting analyzed by weak Bray method in Farm 3 at NCRS cropped with corn during the summer of 2015

The slow release of Pro-germinator represented in higher adsorption of phosphorus on active soil surfaces compared with other sources of liquid phosphorus formulations and helped to investigate the available phosphorus in soil as potential source for plant growth.

Conclusions:

The obtained results proved the concept of the Pro-Germinator slow release of the phosphate and sufficient available phosphorus in soil and dissolved in soil water was ready for use by plants during the 20- 60 days after planting. This enhanced usability could enable Pro-Germinator to be used at lower application rates compared to other phosphorus fertilizers.